

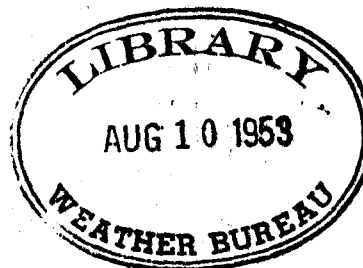
GOVERNMENT OF INDIA
METEOROLOGICAL DEPARTMENT

INDIA WEATHER REVIEW, 1947

ANNUAL SUMMARY PART C STORMS AND DEPRESSIONS

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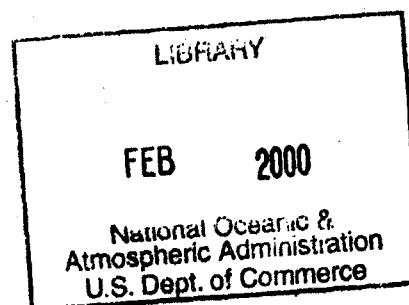


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Published by the Authority of the Government of India

UNDER THE DIRECTION OF

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PUBLISHED BY THE MANAGER OF PUBLICATIONS, DELHI
PRINTED IN INDIA BY THE MANAGER, GOVERNMENT OF INDIA PRESS, SIMLA
1953

Price : Rs. 4-8-0 or 7 sh.

National Oceanic and Atmospheric Administration

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INDIA WEATHER REVIEW, 1947.

ANNUAL SUMMARY.

PART C.

STORMS AND DEPRESSIONS.

I. DEPRESSIONS AND CYCLONIC STORMS

During the year, three cyclonic storms and thirteen depressions formed in the Bay of Bengal, one cyclonic storm and one depression formed in the Arabian Sea and one cyclonic storm over land. The dates of activity of the storms and the greatest barometric depths observed in them are summarised in the table below :—

TABLE 1.

Locality	Month	Date	Greatest observed barometric depth
Arabian Sea ..	April ..	11th—20th	19 mbs.
Bay of Bengal ..	June ..	24th—30th	7.6 mbs.
Bay of Bengal ..	July ..	9th—13th	8 mbs.
Cutch ..	August-September	29th. August—2nd September	10 mbs.
Bay of Beng ..	October	21st—24th	13 mbs. (Estimated)

The detailed descriptions of these storms and depressions are followed by a list of western disturbances and the more important local storms during the year.

1. Shallow Bay depression of the 17th to 21st January 1947.—The changes in the upper winds over Rangoon and Bangkok between the 15th and 16th indicated that a low pressure wave was moving into the Andaman Sea from the Gulf of Siam. Port Blair upper winds which had been east to northeast became southeast to south upto 7,000 ft. on the 16th evening showing that the low pressure wave had moved to the west of that station. On the morning of the 17th Port Blair started raining, while that evening S.S. Marine Adder at Lat. 9°N., Long 87°E., was reporting northwesterly wind force 4 and overcast skies while S.S. Jalaveera at Lat. 9½°N., Long. 86°E., was reporting northerly wind, rough sea and rain. Weather was thus markedly unsettled in the region within three degrees of Lat. 9°N., Long. 91°E. By the 18th morning, the unsettled conditions had moved westnorthwestwards and concentrated into a shallow depression which was centred at 08 hrs. near Lat. 10½°N., Long. 87½°E. The depression remained practically stationary till the next morning and then weakened into an elongated trough of low pressure running in a north-south direction over the south and central Bay of Bengal. The trough became unimportant by the 21st.

2. Bay depression of the 25th February to 2nd March 1947.—On the 22nd morning, reports of ships from the extreme south-east Bay of Bengal indicated that weather was unsettled there. SS. Venerable (Lat. 6½°N., Long. 94°E.) was reporting southeasterly wind force 3 and heavy continuous rain and S.S. Derbyshire at Lat. 5½°N., Long. 90½°E., was

experiencing northerly wind of force 3 and rain. The unsettled conditions shifted slightly westwards during the next two days and on the 24th morning, they became more marked as could be seen by the cyclonic circulation of the upper winds at 5,000 ft. along the Coromandel coast and Ceylon. Probably a depression had formed by the 24th morning, but its centre could not be fixed owing to lack of data. On the next morning however, the centre of the depression could be fixed with the help of ships' observations at Lat. 6½°N., Long. 89°E. The depression moved northwestwards and was centred at 17 hrs. of the 25th near Lat. 7°N., Long. 88°E. Continuing to move slowly in the same direction, it was centred at 17 hrs. of 26th near Lat. 8°N., Long. 87°E. and near Lat. 9°N., Long. 85°E. on the morning of the 28th. It weakened thereafter, but moved westwards being centred near Lat. 9°N., Long. 82°E. on the morning of the 1st of March. It persisted there for the next 24 hours. Weakening further, it moved away westwards as a low pressure wave across Ceylon by the 2nd evening after causing fairly widespread rain in southeast Madras and south Malabar on that day.

3. Severe cyclone in the Arabian Sea of 11th to 20th April 1947.—An incursion of southerly air took place in the extreme southeast Bay of Bengal on the 2nd April and on the 4th a trough of low pressure appeared over the south Andaman Sea. Thereafter, weather remained unsettled in the south Bay for about a week, and on the 12th, the trough of low pressure extended from the Comorin area to the south-east Arabian Sea off the Malabar coast causing markedly thundery weather over that region. A depression formed on the morning of the 13th with its central region near Lat. 9½°N., Long. 74½°E. S.S. Silver Larch at Lat. 9½°N., Long. 73½°E. reported northwesterly wind B.F. 5, rough seas and rain. Moving in a northwesterly direction and intensifying rapidly, the depression was centred near Lat. 11°N., Long. 72½°E. at 08 hrs. of the 14th. The upper winds at Minicoy had increased to B.F. 9 to 10 by that time. At 14 hrs. of the same day S.S. Silver Larch at Lat. 12½°N., Long. 69½°E. reported northerly winds B.F. 7, heavy rains and very rough seas. The deep depression had intensified into a cyclonic storm by 1400 hrs. and was centred at 1700 hrs. near Lat. 13°N., Long. 71°E. For the whole of that day, S.S. Itria in the eastern semicircle of the cyclone experienced winds of B.F. 8. On the 15th morning, S.S. Loch Quinloch at Lat. 15¾°N., Long. 71¼°E. reported easterly winds B.F. 8 and a pressure of 996 mbs. while S.S. Brookdale, about 170 miles westwards, experienced ENE wind B.F. 8, very rough seas and continuous rain. The cyclone was centred at 08 hours. I.S.T. of the 15th near Lat. 14½°N., Long. 70½°E. and at 14 hrs. near Lat. 16½°N., Long. 70°E. The pressure at the centre of the cyclone was probably not less than 990 mbs. at this stage as judged from the fact that the pressure of S.S. Brookdale at 1100 hrs. was 996 mbs. when it was to the north of the centre and at 1400 hrs. was 993 mbs. when

it was to the south of the centre. By 17 hrs. of that day the cyclone became severe and had a core of hurricane winds S.S. Loch Quinoch at Lat. 17°N., Long. 69½°E. reporting northerly wind of B.F. 11. The estimated pressure deficiency at the centre at that time was 19 mbs. From the 15th to 16th evening the storm moved in a practically northerly direction and was centred at 08 hrs. I.S.T. of 16th

near Lat. 18°N., Long. 70°E. and at 17 hrs. I.S.T. of 16th near Lat. 19°N., Long. 70°E. The pressure changes at 08 hrs. of the 16th showed that the cyclone might recurve to northeast. S.S. Varela which was steaming towards Bombay passed through the northeast and southeast quadrants of the storm. The following observations of S.S. Varela are of interest:

TABLE 2

Date	Hour IST	Position		Wind		Weather Remarks
		Lat.	Long.	Direction	Force	
16-4-47	0800	20° 15'	69° 40'	NE	5	Continuous rain, Moderate sea.
"	1200	19° 45'	70° 15'	NE	7	Rainsqualls, very rough seas.
"	1500	19° 42'	70° 42'	NE	8	Do.
"	1600	19° 40'	70° 47'	ENE	9	Rainsqualls, high seas.
"	1800	19° 36'	70° 57'	SE	9	Rainsqualls, very rough seas.
"	1900	19° 34'	71° 02'	SE	10	Do.

After the 16th evening, the storm began to recurve north-eastwards. The observatory at Veraval began reporting northeasterly winds of B.F. 7 or higher from 1700 hrs. of the 16th. By 2200 hrs. of the same day, the winds reached force 9 and the sea at the port became very rough. The centre of the cyclone at that time was very near. Lat. 19½°N., Long. 70°E. The wind speed continued to be

force 9 or more till 1500 hrs. of the 17th reaching a maximum of 66 m.p.h. at 1400 hrs. of 17th. With the northeasterly movement of the storm towards the Gulf of Cambay, the winds at Veraval which had attained gale force gradually backed. The following table gives the wind speed and direction recorded at Veraval from 1700 hrs. of 16th to 0200 hrs. of 18th.

TABLE 3

Wind Speed and Direction at Veraval Observatory

Date	Time IST	Wind		Bar. pressure	Date	Time IST	Wind		Bar. Pressure
		Direction	Speed (mph)				Direction	Speed (mph)	
16-4-47	1700	NE	36	1002.0	17-4-47	1200	NE	60	996.9
"	2100	NE	40	1002.4	"	1300	NE	60	995.8
"	2200	NE	52	1003.3	"	1400	NE	66	996.7
"	2300	NE	58	1002.6	"	1500	NE	54	996.3
17-4-47	0000	NE	52	1000.7	"	1600	NNW	38	996.4
"	0100	NE	52	1001.2	"	1700	NNW	50	996.7
"	0200	NE	52	1000.7	"	1800	NNW	34	997.8
"	0300	NE	54	999.2	"	1900	NNW	24	999.2
"	0400	NE	54	999.2	"	2000	NNW	28	1001.4
"	0500	NE	50	997.6	"	2100	NNW	26	1002.1
"	0600	NE	52	997.4	"	2200	NNW	30	1003.4
"	0700	NE	54	996.9	"	2300	NW	26	1003.9
"	0800	NE	56	996.7	18-4-47	0000	NW	22	1003.9
"	0900	NE	60	997.6	"	0100	NNW	26	1003.7
"	1000	NE	58	997.1	"	0200	NNW	26	1003.4
"	1100	NE	60	997.0	"	0300	NW	18	1002.9

The storm was centred near Lat. 20°N ., Long. $70\frac{1}{2}^{\circ}\text{E}$. at 08 hrs. of 17th and was moving parallel to the south Kathiawar coast. At 02 hrs. of the 18th, Surat began to experience southerly winds of B.F. 7, but the force of the wind gradually died down after the noon of the same day. On the morning of the 18th the cyclone was close to the coast just to the south of Bhavnagar and was weakening rapidly. The next morning it lay as a low pressure area north of Surat and dissipated by the morning of the 23rd.

The cyclone brought about a temporary advance of the monsoon into Malabar, Kanara, the Konkan, Gujarat and Saurashtra.

Widespread and locally heavy rain commenced in the extreme south of the Peninsula on the 11th and occurred generally over the Peninsula south of Lat. 12°N ., on the next three days. Rainfall then shifted to the Konkan and the Bombay Deccan and thence to the south Kathiawar and east Gujarat. Locally very heavy rain fell in Bhavnagar and Junagad states on the 17th and 18th; many places in the Bhavnagar State recorded over ten inches of rainfall in 24 hours. Panchtalvada recorded $17\cdot5''$ of rain during the 24 hours ending 0800 hrs. on the 18th.

In south Kathiawar, particularly in the Bhavnagar State, hundreds of houses were destroyed; large number of cattle died due to rain and winds and cotton and pulse crops suffered serious damages. The strong winds which blew with speed exceeding 50 m.p.h. from 22 hrs. of 16th to 15 hrs. of 17th in and around the port of Veraval caused considerable damage to country craft and small boats. The losses in the Veraval harbour alone were estimated at several lakhs of rupees. According to newspaper reports the heavy rains caused by the storm in its earlier stage accompanied by strong winds in the Nilgiris uprooted many trees and caused much dislocation of traffic. In other places in the south Peninsula there was considerable damage due to the rains while a branch line in the S.I. Railway was completely washed away by the floods.

The noteworthy district averages of rainfall and particularly heavy falls are given in the following table :—

TABLE 4

District	District averages on			Particularly heavy falls
	17th	18th	19th	
Broach .. ..	..	4·0	1·7	18th, Broach 5·0", Vagra 5·1" Jam- buar 5·2".
Baroda .. ..	..	2·9	..	
Amreli	6·4	2·3	..	17th, Amreli 7·1", Khambla 5·1".
Junagad	3·7	1·8	..	
Gondal	1·8	2·5	..	
Bhavnagar ..	2·7	6·1	..	18th, Bhavnagar 12·1", Lilia Mota 12·6", Umrata 9·5", Gogha 8·9".

4. Deep Bay depression of 18th to 20th April 1947.—On the morning of the 16th of April, the upper winds over Mergui were southsouthwest force 4 to 6, while those over

Port Blair were northwesterly 3 to 4 B.F. below 3,000 ft. a.s.l. These indicated that conditions were becoming unsettled in the north Andaman Sea. The unsettled conditions became more marked during the course of the next 48 hours, and, by the morning of the 18th, had concentrated into a depression with centre near Lat. 13°N ., Long. 96°E . By the evening of the same day, the depression had intensified further and was centred near Lat. 14°N ., Long. 95°E . The deep depression then started moving north-northeastwards and was centred near Lat. 15°N ., Long. 96°E . on the 19th morning. By the 20th evening it had passed inland into lower Burma. Due to insufficiency of observations, it is not possible to state whether the deep depression at any stage developed into a cyclonic storm; but according to newspaper reports, severe gales blew over Rangoon and destroyed 5,000 houses on the 20th. The BHSN liner *Mr Harvey Adamson* which left Rangoon on the 17th for Mergui was not heard of thereafter.

5. Shallow Bay depression of 9th to 10th June.—The monsoon was strong over the south and central Bay of Bengal on the 8th morning, and on that evening a concentrated fall of pressure was noticed along the Orissa-south Bengal coast. On the morning of 9th pressures had fallen further over the head of the Bay of Bengal and the surface and upper wind charts indicated that weather was markedly unsettled in the north Bay. By that evening, rain commenced at all stations along the Arakan coast. By 02 hrs. of the 10th the unsettled conditions developed into a depression which was centred near Lat. $21\frac{1}{2}^{\circ}\text{N}$., Long. 90°E . at 08 hrs. and close to the coast near Barisal at 17 hrs. The depression weakened thereafter and by the next morning it passed inland northwards as a low pressure wave.

In association with this depression widespread rainfall occurred in Bengal, Chota Nagpur and north Orissa on the 9th and 10th. Widespread and locally heavy rain also occurred along the Arakan-Chittagong coast and in Assam between the 10th and 12th.

Some of the noteworthy amounts of rainfall reported were :—

Goalpara (Assam) .. 5·0" on 12th

Burdwar (Assam) .. 6·0" on 12th

Akriganj (Bengal) .. 5·2" on 9th

6. Cyclonic storm in the Bay of Bengal from 24th June to 30th June 1947.—The pressure changes over Burma and the changes in the upper winds over Rangoon and Mandalay on the 18th and 19th indicated that a low pressure wave was moving westwards across central Burma. By the 20th morning, the low pressure wave had moved into the north Bay and a well-marked cyclonic circulation had established itself in the upper air over that region below 7,000 feet. The unsettled conditions persisted there for the next three days, became more marked on the 23rd evening when a number of ships off the Arakan coast reported heavy continuous rain. By the next morning, a shallow depression had formed, with its centre near Lat. 19°N ., Long. 90°E . During the course of the next 24 hrs. the depression became deep and was centred at 08 hrs. of the 25th near Lat. $19\frac{1}{2}^{\circ}\text{N}$., Long. 90°E . Several ships in the west central Bay reported squally weather, rough seas and heavy rain on the 25th morning. The deep depression remained practically stationary till that evening and began moving west-northwestwards later. It intensified during the night

and at 08 hrs. of the 26th was probably a cyclonic storm of small extent centred near Lat. 20°N., Long. 89°E. Continuing to move slowly westnorthwestwards, it was centred about 70 miles southeast of Balasore on the morning of 27th. The storm crossed the coast between Balasore and Chandbali by midday and weakened rapidly into a depression which was centred at 17 hrs. of 27th about 50 miles west of Balasore. Moving in the same direction and weakening further, it was centred about 100 miles southeast of Pendra on the 28th morning and between Sutna and Pendra on the 29th. It became unimportant by the 30th evening.

Under the influence of this storm, the monsoon penetrated into the central parts of the country and the United Provinces. Locally heavy rain was reported from Orissa, the Central Provinces, Central India and the east United Provinces.

The noteworthy district averages and particularly heavy falls of rain are given in the following table.

TABLE 5

Province and District	District averages on				Particularly heavy falls
	27th	28th	29th	30th	
<i>Orissa</i>					
Puri	3.0	..	..	..	27th, Bampur 11.9", Bhubaneswar 6.2", 27th, Jagatsinghpur 9.4".
Cuttack .. ..	..	..	..	..
<i>East Central India</i>					
Bondelkhand ..	..	..	2.0	..	29th, Chhatarpur 5.3", Dhanwari 5.5".
<i>United Provinces</i>					
Kanpur .. ..	..	..	..	3.0	30th, Kalpi (Jalaun) 5.4", Bognipur 6.3".
Lucknow .. ..	..	..	..	4.3	30th, Malikahad 5.5".
Unao .. ..	..	..	..	3.1	30th, Saipur 6.3".
Hardoi .. ..	..	..	..	3.1	
Kheri .. ..	..	..	..	3.1	
Bara Banki ..	..	..	..	3.3	30th, Nawabganj 5.7".

7. Cyclonic storm of 9th to 12th July in the Bay of Bengal.—On the morning of the 7th July, pressures were falling over Burma and lower Assam and the upper winds over Mandalay were strong southerly while those over Akyab were strong westsouthwesterly below 3,000 ft. a.s.l. These indicated that a low pressure wave was travelling across central Burma. By the 9th evening, the low pressure wave had moved into the north Bay where weather had become unsettled. By the next morning a shallow depression formed with its centre near Lat. 19°N., Long. 90°E. It intensified, moved westwards and lay as a deep depression centred near Lat. 19°N., Long. 88°E. on the 11th morning. Intensifying further, it lay probably as a cyclonic storm of small extent, centred at 17 hrs. of 11th near Lat. 18½°N., Long. 86°E. Several ships in the west central Bay of Bengal experienced squally weather, very rough seas and heavy rain at this time. The surface winds along the Circars coast north of Cocanada had also appreciably streng-

thened, Gopalpur reporting a northeasterly wind of force 7 and Puri an easterly wind of force 6. The coastal observations further clearly showed that the storm of small extent had moved westsouthwestwards. Thereafter however the storm moved west or westnorthwest, and weakening at the same time, lay as a deep depression close to the coast near Gopalpur. The depression crossed the coast by the midday of the 12th, weakened further and lay at 17 hrs. over the east Central Provinces with its centre about 100 miles northeast of Jagdalpur. It lay on the 13th morning as a low pressure area extending from the west Central Provinces to Orissa and became unimportant thereafter.

In association with this storm, rainfall was widespread and locally heavy along the north Madras coast, in east Hyderabad and the adjoining parts of the east Central Provinces on the 12th. Widespread rain also occurred in the central parts of the country on the 13th and 14th.

Some of the noteworthy amounts of rainfall recorded were Calingapatam 4" and Cocanada 5" on 12th.

8. Shallow Bay depression of 15th to 18th July.—In the wake of the cyclonic storm of 9th to 13th July, pressures were noticed to be falling afresh over northeast India on the 14th morning. The fall became more marked by that evening and a region of concentrated fall was noticeable around the head of the Bay of Bengal. The evening upper winds showed that the monsoon trough had extended into the north Bay. By the 15th morning, a shallow depression had developed with its centre near Lat. 19½°N., Long. 89½°E. It moved northwestwards without appreciable intensification and, at 08 hrs. of the 16th, was close to the coast between Balasore and Chandbali. By that evening it passed inland and was centred about 50 miles northnorthwest of Jamshedpur on the 17th morning. Thereafter it moved westnorthwestwards, weakening at the same time, and became unimportant by the 20th.

Under the influence of this depression, the Arabian Sea branch of the monsoon was vigorous along the Konkan coast on the 15th and 16th. Widespread and locally heavy rain also occurred in Orissa and the Central Provinces from the 14th to 16th. Some of the noteworthy amounts of rainfall associated with the depression were :

Bhanupratappur (Chhatisgarh State)	8.5" on 15th
Surguja (Ambikapur State)	.. 7.7" on 17th
Langi (Raipur District)	.. 7.6" on 16th
Waramani (Raipur District)	.. 8.2" on 16th
Bano (Ranchi district)	.. 9.9" on 17th

9. Bay depression of 21st to 30th August and cyclonic storm of 31st August to 2nd September.—For a week prior to the 14th of August, the monsoon had been weak over the Bay of Bengal. On the 14th morning, pressures started falling over Burma and by the next morning, a feeble 'low' was noticed over central Burma. The 'low' became well-marked by the 15th evening when the cyclonic circulation associated with it, extended upto 10,000 ft. Simultaneously, the Arabian Sea monsoon strengthened along the Malabar coast as could be seen from the very heavy rain which had occurred along the Malabar coast. The low pressure area moved into the northeast Bay and, on the 16th morning, a well-marked trough of low pressure was seen extending from

the deltaic Bengal to the south Bay with its active region near about Lat. 20°N ., Long 91°E . The trough persisted with little change except for a slight shift westward until the morning of the 20th when a depression was probably forming with central region near Lat. 17°N ., Long. $87\frac{1}{2}^{\circ}\text{E}$. The depression was centred near Lat. 17°N ., Long. 87°E . on the next morning. Moving slowly north-westwards and intensifying slightly, it lay with its centre near Lat. $17\frac{1}{2}^{\circ}\text{N}$., Long. $86\frac{1}{2}^{\circ}\text{E}$. at 08 hrs. on the 22nd. It then curved toward north-northeast and was centred near Lat. $18\frac{1}{2}^{\circ}\text{N}$., Long. 87°E . on the morning of the 23rd and near Lat. 20°N ., Long. $87\frac{1}{2}^{\circ}\text{E}$. on the 24th morning. Moving northwards at first and north-westwards later, the depression crossed the coast near Balasore by that night. It then changed its course towards west-northwest and was successively centred between Daltonganj and Champa on the 25th morning, about 30 miles northwest of Jubbulpore on the 26th morning, near Brijnagar on the 27th morning and about 50 miles west of Barmer on the 28th morning. It then moved into lower Sind where it lay as a shallow depression on the morning of the 29th.

Meanwhile, a considerable strengthening of the Arabian Sea branch of the monsoon had taken place off the west Kathiawar coast as was indicated by ships in that region reporting strong winds, heavy squalls and heavy rain, and a trough of low pressure formed over Kathiawar and Cutch

on the 28th morning. The shallow depression over Sind apparently merged into this trough and a deep depression formed by the evening of the 29th. It was centred about 50 miles to the north of Bhuj on the morning of the 30th when Bhuj and Dwarka were having pressures of 8.7 and 8.2 mbs. respectively below the normal value. During the course of the next 24 hours, it intensified further into a cyclonic storm. Bhuj reported west-southwesterly surface winds of force 7 at 17 hrs. of 30th and was having a negative pressure departure of 10 mbs., while Dwarka was experiencing west-north-westerly wind of force 8. Jamnagar reported a steady surface wind of 35-40 m.p.h. between 0800 hrs. of 30th and 1400 hrs. of 31st while S.S. Howra lying 50 miles west of Dwarka experienced winds of gale force throughout the 30th. The storm remained practically stationary and began weakening from the morning of the 31st, and became unimportant by the 2nd September morning.

The storm in its earlier stages as a depression in the Bay of Bengal was responsible for active to strong monsoon in northeast India and the central parts of the country and Rajputana. In its later stages, it caused vigorous monsoon in Cutch and an extension of active monsoon into the Punjab, the North-West Frontier Province and Sind. Rainfall was particularly heavy in west Central India, east Rajputana and Cutch.

The noteworthy district averages and amounts of particularly heavy falls are given in the following table :—

TABLE 6

Province and District	District averages on				Particularly heavy falls.
	25th	26th	27th	28th	
<i>Central Provinces</i>					
Balaghat	3.6	..	..	..	25th, Waraseoni 6.9".
Saugor .. .. .	..	2.4	..	..
<i>Central India (Bhopal Agency)</i>					
Narasingarh .. .. .	..	3.1	5.8	..	27th, Chhapra 6.4".
Rajgarh	2.4	5.3	..	4.5	27th, Biaora 6.4" Talen 6.1".

TABLE 7

Province and District	District Averages on							Particularly heavy falls
	27th	28th	29th	30th	1st	2nd	3rd	
RAJPUTANA								
<i>Jodhpur State</i>								
Barmer .. .. .	..	4.0	..	..	..	..	..
Kotah	3.4	..	..	..	2.4	..	..	27th, Iklera 6.5", Manoharthana 9.5", Bakani 7.3". 2nd, Sept. Manoharthana 7.3".
Jhalawar	5.8	..	..	..	..	..	..	27th, Brijnagar 6.7", Dug 5.6", Bhavaniganj 5.1".
Tonk .. .. .	..	..	..	..	..	..	..	1st Sept., Sironj 10.0".
BOMBAY								
Jamnagar .. .. .	..	..	..	5.8	..	..	5.2	
Surat .. .. .	..	..	..	..	..	2.0	..	
Panchmahal .. .. .	..	..	..	..	..	2.2	..	
Thana .. .. .	..	..	..	..	..	..	..	3rd, Dahadu 5.7".

10. Bay of Bengal depression of 26th August to 2nd September 1947.—After the last depression had crossed the Orissa coast on the 24th evening, weather continued to be disturbed in the north Bay of Bengal until the 26th morning with the seasonal trough of low pressure still extending into that region. The 17 hrs. observations of the 26th showed falling pressures generally in northeast India with comparatively larger falls round the head of the Bay, and by the morning of the 27th a depression had developed with its centre near Lat. 19°N., Long. 89°E. The depression considerably strengthened the monsoon in the west Central Bay from where a number of ships reported strong winds, squally weather and rough seas. The depression moved northwestwards and was centred at 1700 hrs. of 27th near Lat. 20°N., Long. 88°E. Thereafter it moved westnorthwestwards and at 08 hrs. of 28th lay close to the coast just south of Chandbali; it crossed the coast during that afternoon and was centred about 30 miles north of Cuttack at 17 hrs. Continuing to move west-northwestwards, it weakened and lay on the 29th morning as an extended 'low' from the east Central Provinces to the Orissa coast, its central region being about 50 miles southeast of Pendra. The low persisted without appreciable movement for the next two days, then shifted north-westwards and became unimportant by the morning of the 2nd September.

While tarrying over the east Central Provinces and the neighbourhood, the depression caused locally heavy rainfall in that area from the 29th to 1st. Associated with this depression there was also widespread and locally heavy rain in Orissa between the 27th and 29th and in the west Central Provinces between the 31st and 2nd.

A table showing noteworthy district averages of rainfall and amounts of particularly heavy falls is given below :—

TABLE 8

Name of Province and District	District averages on				Particularly heavy falls
	29th	30th	31st	1st	
<i>Orissa</i>	"	"	"	"	
Cuttack .. ..	..	..	..	..	28th, Bartoi 7.1".
Puri .. ..	..	..	..	..	27th, Gopalpur 12.9", Kokatpur 7.0".
<i>Central India</i>					
Bhilai	4.1	..	..	..
Ujjain	3.2	..	..	..
Mohamedgarh ..	..	..	..	..	29th, Mohamedgarh 6.0".
Southern Pawa ..	3.2	..	..	..
Bhopal East ..	..	..	..	5.1	1st, Begumganj 5.5", Chikl d 5.0", Kalia- kter Gharaganj 7.5", Raes-n 7.3", Shah- ganj 7.2", Salwan 9.0", Sultanpur 6.4", Udaipura 6.8".
Raigarh .. ..	..	..	..	5.5	1st, Kotra 8.5".
<i>Central Provinces</i>					
Deog	3.0	2.8	3.3	..	30th, Bhilai 8.0", 31st, Bhilai 6.0".

TABLE 8—contd.

Name of Province and District	District averages on				Particularly heavy falls.
	29th	30th	31st	1st	
<i>Central Provinces—contd.</i>	"	"	"	"	
Raipur	3.4	2.4	3.5	..	29th, Mahasamund 5.1", Deobhog 5.3", 30th, Kurud 5.1", 31st, Gariabund 7.8", Pin- draon 5.4", Gattasilli 5.3", Bhatagaon 5.0".
Bilaspur .. ..	..	..	..	..	30th, Sheorinarayar 7.7".
Saugor .. ..	..	..	2.2	..	
Bhandara	3.2	2.4	5.8	..	29th, Gondia 5.8", Pangree 6.4", 30th, Bodalkasa 8.1", 31st, Bhandara 8.3", Sa- koli 8.1", Tirora 8.4", Chandpur 6.0", Bodal- kasa 14.8", Chorkha- mara 9.3", Pangree 6.3".
Balaghat	2.5	2.6	3.7	2.9	29th, Lanji 6.2", Wara Main 5.0", 30th, Don- gargaon 5.1", 31st, Lanji 5.0", Wara- seoni 5.9", Sarathi 6.4", Famunia 6.7", Saleteka 5.6", Dongar- gaon 5.3", 1st, Wara Main 5.6", Dhuti 5.4".
Hoshangabad ..	..	..	3.1	..	1st, Gadgarwar: 6.4".
Chhindwara ..	..	..	3.5	..	1st, Kotra 8.2".

11. Bay of Bengal depression of 2nd-12th September 1947.—With a strengthening of the monsoon in the north Bay on the 30th August several ships in the region reported heavy squalls and rain. Weather became unsettled in the north Bay by the evening of the 31st and on the next morning a shallow low had formed at the head of the Bay with the cyclonic circulation well marked in the upper air. The low shifted slightly northwards and was a shallow depression of small extent at 02 hrs. I.S.T. of 2nd with its centre within half a degree of Lat. 21°N., Long. 89°E. Moving rapidly north-northwestwards it crossed the coast and lay at 08 hrs. I.S.T. close to Calcutta. Moving north-westwards, and intensifying to some extent, the depression was centred near Burdwan on the 3rd morning and between Daltonganj and Hazaribagh on the 4th. It weakened thereafter but continued to move westnorthwestwards and lay near Sutna on the 5th morning and near Jhansi on the 6th. Then taking a northerly course it was centred near Gwalior on the morning of 7th, and later curving towards east it lay on the 8th morning with its centre near Mainpuri. While weakening further, it was centred near Fatehpur on the 9th morning and near Allahabad on the next day where it persisted until it became unimportant.

Associated with this depression, locally very heavy rain occurred over southwest Bengal on the 2nd and 3rd, Calcutta recording 9" of rain between 2 A.M. and 5 P.M. of the 2 d. Locally heavy rain also occurred in Chota Nagpur, Central India and the west United Provinces as the depression passed through those regions.

The noteworthy district averages and particularly heavy falls of rain associated with the depression are given in the following table :—

TABLE 9

Province and District	District averages on			Particularly heavy falls
	2nd	3rd	4th	
<i>Bengal</i>				
24 Parganas ..	2.8	2.3	..	
<i>Chota Nagpur</i>				
Hazaribagh ..	..	2.1	1.7	4th, Hunterganj 9.4".
Ranchi ..	..	..	..	4th, Daltonganj, (Palamau). 5.9".
<i>West United Provinces</i>	6th	7th	8th	
Dehra Dun ..	..	1.6	1.9	7th, Dehra Dun 5.4".
<i>West Central India</i>				
Bhopal West ..	3.2	..	..	6th, Sehore 10.3", Daroha 5.6".

12. Arabian Sea Depression of 22nd to 24th September 1947.—On the 22nd September a trough of low pressure extended from the Deccan to the east Arabian Sea off the Konkan coast, and by that evening a deep depression had formed which was centred at 08 hrs. of 23rd about 50 miles southwest of Bombay. Very heavy rain occurred in the north Konkan on the 21st and 22nd, Bombay recording 8" and 12" during the 24 hrs. ending at 08 hrs. on the 22nd and 23rd respectively. At 08 hrs. of 23rd, Bombay had a pressure departure of —10 mb. Moving northwards during the course of the day, the deep depression was centred about 100 miles northwest of Bombay at 17 hrs. The north Konkan and south Kathiawar coasts experienced strong winds on the 23rd evening and night. The depression moved northnortheastwards thereafter and crossed the coast to the south of Surat during the early hours of 24th. Dahanu reported westerly wind of force 8 at 08 hrs. and Surat had a pressure deficiency of 11.6 mbs.

After crossing the coast, the depression weakened and continued to move northnortheastwards. It lay between Ahmedabad and Baroda at 17 hrs. of 24th, between Ahmedabad and Udaipur at 08 hrs. of 25th and about 50 miles east of Bikaner at 08 hrs. of 26th. It then weakened further and moved away towards the East Punjab hills.

In association with this depression widespread rain fell over the whole of the Peninsula between the 20th and 24th and in east Gujarat, east Rajputana, west Central India the East Punjab and the west United Provinces between the 25th and 27th. Rainfall was locally heavy in the north Bombay Deccan and very heavy in the north Konkan, the East Punjab and in and near the hills of the west United Provinces. The heavy rains in the Punjab resulted in serious floods in all the rivers of the Province, which completely paralysed all means of transport and communication and caused considerable hardship to the stranded refugees.

The noteworthy district averages and particularly heavy falls of rain associated with the depression are given in the following table :—

TABLE 10

Province and District	District averages on				Particularly heavy falls
	22nd	23rd	24th	25th	
<i>Bombay</i>					
Savantwadi ..	..	1.1	..	..
Anreli (Baroda State) ..	..	3.0	..	..
Bhavnagar ..	2.4	2.0	..	..
Thana ..	3.4	..	..	..	22nd, Bassein 5.1".
Kolaba ..	2.8	3.5	..	..	22nd, Panvel 7.5", 23rd, Alibag 5.9", Uran 7.4".
Ratnagiri ..	..	3.2	..	..	23rd, Rajapur 10.3", Khed 7.1".
Kanara ..	..	1.7	..	..
<i>United Provinces</i>					
Saharanpur ..	..	0.8	..	..
Bulandshahr ..	1.4	..	..	..
Aligarh ..	1.9	..	..	..
Etah ..	0.9	..	..	..
Bijnor ..	..	1.5	..	..
Budaun ..	1.8	..	..	..
Bahraich ..	..	..	4.4	..	24th, Nanpara 5.4".
Barabanki ..	..	..	3.5	..	24th, Fatehpur 7.2".
<i>East Punjab</i>					
Karnal ..	..	..	1.8	..	24th, Thanesar 6.4".
Simla ..	..	..	2.4	3.8	25th, Barauli 5.1", Kotkhai 5.3".
Kangra ..	..	..	1.1	..	24th, Dharamshala, (Lower). 8.1".

13. Deep Bay depression of 25th to 29th September 1947.—Conditions became unsettled in the west central Bay of Bengal on the 19th when a cyclonic circulation was noticeable in the upper air over the whole of the Peninsula and the central parts of the country upto 7,000 ft. a.s. l. On the 21st morning a well-marked trough of low pressure was extending from the east Deccan to the west central Bay of Bengal. The monsoon strengthened over the southwest Bay of Bengal and its neighbourhood on the 23rd September as was evident from the reports of strong winds, rough seas and rain by ships in that area; and with this, the trough which had been persisting with varying intensity, concentrated into a depression by the 25th morning with centre near Lat. 17°N., Long. 88°E. Moving in a westnorthwesterly direction and deepening at the same time, it was centred on the morning of the 26th near Lat. 17½°N., Long 85°E. At 17 hrs. of the same day, the deep depression lay with its centre about 80 miles to the east of Vizagapatam. It crossed the coast near Vizagapatam during the night and weakening into a depression lay at 08 hrs. of 27th over the east Central Provinces with its centre near Jagdalpur. It then moved

further westnorthwest and was centred about 50 miles northeast of Nizamabad on the 28th morning and near Aurangabad on the 29th morning. Thereafter it became diffuse and lay on the 30th morning as a shallow low extending from east Gujarat to Berar, becoming unimportant by the next morning.

In association with this depression, widespread rain fell along and near the Circars coast from 25th to 27th, in Hyderabad and the Central Provinces on the 27th, 28th and 29th and over the north Bombay Deccan and the north Konkan on the 29th. Locally very heavy falls were recorded at a number of places in Hyderabad and the north Bombay Deccan. The noteworthy district averages and the particularly heavy falls are given in the table below :—

TABLE 11

Province and District	District averages on			Particularly heavy falls
	27th	28th	29th	
<i>Hyderabad</i>				
Bidar .. ..	..	..	..	28th, Bidar 5.0".
Bir .. ..	..	3.2	3.0	
Karimnagar .. ..	..	3.3	..	
Medak .. ..	..	4.2	..	28th, Medak 8.3", Pocharam 5.3", Royanpalli 7.0".
Mandad	2.8	3.2	..	27th, Basar 5.6", 28th, Nanded 6.0".
Nizamabad .. ..	..	4.9	..	27th, Kamareddi 5.2", Navipet 5.3", 28th, Nizamabad 7.2", Achampet 5.4", Berlam 7.6", Chintakunta 6.6", Jakora 10.9", Alisagar 7.1", Ramondrapalli 9.7", Manchappa 6.1", Satapur 8.3", Bodhan 8.5".
Osmanabad .. ..	..	2.3	2.0	
Parbhani .. ..	..	2.2	..	
Hyderabad .. ..	..	3.9	..	
Warangal	4.5	..	..	27th, Khammameth 6.0", Mahbubabad 6.0", Narsampet 7.0", Singalhopalayam Project 9.0".
<i>Bombay</i>				
Nasik .. ..	..	4.3	..	28th, Trimbak 7.1", Igatpuri 6.6", Nandgaon 9.5", Polthan 6.0".
Ahmednagar .. ..	..	3.7	..	28th, Shergaon 7.6".
Thana .. ..	..	2.7	..	
Kolaba .. ..	..	2.6	..	
<i>Central Provinces and Berar</i>				
Akola .. ..	..	2.3	..	
Amravati .. ..	..	..	..	28th, Amravati 5.6".
Buldhana .. ..	..	2.1	..	

14. Depression of 11th to 13th October 1947 and depression of 15th October 1497 in the Bay of Bengal.—The seasonal trough of low pressure over the central Bay of Bengal became marked on the 11th of October when the stations along the Orissa coast were raining. By 1700 hrs. of that day a shallow depression formed with its centre near Lat. 14°N., Long. 87°E. It moved northwestwards while intensifying and at 08 hrs. of 12th was centred near Lat. 15°N., Long. 85°E. On the morning of the 13th it was centred near Lat. 15½°N., Long. 84½°E. and thereafter, it weakened into a trough of low pressure extending from the west Central Bay to the north Bay. The trough of low pressure began to concentrate at its northeastern end on the 14th and by 02 hrs. of the 15th a depression had formed with its centre near Lat. 21°N., Long. 90°E. This depression moved northeastwards and at 17 hrs. of the same day (15th) was centred about 100 miles southwest of Chittagong. Moving in the same direction, it passed inland into north Burma and the adjoining areas of upper Assam by the 16th.

In association with this depression widespread rain occurred along the Circars, Orissa and Bengal coasts on the 12th and over Orissa, West Bengal and lower Assam on the 13th. It was also responsible for widespread and locally heavy rain in lower Assam and the coastal districts of Eastern Pakistan on the 14th and 15th. Cox's Bazar reported 22" of rain during the 24 hours ending at 5 p.m. on the 15th. The other noteworthy amounts of rainfall are Cherrapunji 7.0", Comilla 5.0", Srimangal, 4.0" and Karimganj (Cachar) 5.0" on the 14th and Cherrapunji 11" on the 15th.

15. Severe cyclonic storm in the Bay from 21st to 24th October 1947.—On the morning of the 18th October weather was becoming unsettled in the Andaman Sea and the extreme southeast Bay of Bengal. By the next morning pressures had fallen below the normal over the Andaman Sea, and a trough of low pressure appeared in the southeast Bay and the south Andaman Sea by the evening. The trough intensified during the course of the next 24 hours. Port Blair started raining by the 20th evening when the station was reporting eastnortheasterly surface wind of force 5. By 02 hrs. of 21st, a depression had formed, which was probably deep, centred near Lat. 8½°N., Long. 92½°E. Port Blair surface winds had strengthened to force 7 by that time. At 08 hrs. of 21st, the deep depression was centred near Lat. 9°N., Long. 92°E. and Port Blair was reporting winds of gale force at 1000 and 2000 ft. a.s.l. By 17 hrs. of that day, the depression had probably intensified into a cyclonic storm centred near Lat. 10°N., Long. 91°E. Port Blair was at that time reporting easterly winds of force 7 with heavy rain, while S.S. Talma at Lat. 6½°N., Long. 92½°E. was reporting southsouthwesterly wind of force 7. By 08 hrs. of the 22nd the storm had intensified further and was centred near Lat. 11½°N., Long. 90½°E. with the pressure departure at the centre of the storm 15 or 16 mbs. below the normal. Ships as far away as 300 miles from the centre of the storm on all sides were reporting winds of force 6 or 7. Also heavy rain had fallen along the northeast coast of Ceylon and the south Coromandel coast. The upper winds over the whole of the east coast of the Peninsula, south Bengal and the Burma coast were gripped in the circulation of the storm upto 7,000 ft. The storm was centred near Lat. 13°N., Long. 90°E. at 17 hrs. of 22nd, and by the next morning it took a turn towards northnortheast and was centred

at 08 hrs. near. Lat. $16\frac{1}{2}^{\circ}\text{N.}$, Long. $89\frac{1}{2}^{\circ}\text{E.}$ The storm was severe at this time and had probably a core of hurricane winds ; ship S.S. Separosic at Lat. $16\frac{3}{4}^{\circ}\text{N.}$, Long. $91\frac{1}{2}^{\circ}\text{E.}$, about 130 miles from the centre of the storm was experiencing southsoutheasterly wind of force 10. Skies became cloudy along the Arakan-Chittagong coast by the 22nd evening and, by the early morning of the 23rd, widespread rain had fallen over that coast, all stations raining at 08 hrs. Akyab reporting heavy continuous rain. Moving rapidly in the same direction the severe storm was centred at 17 hrs. near Lat. 19°N. , Long. 90°E. Chittagong was at that time having a negative pressure departure of 12 mbs. At 22 hrs. of the same day, the storm lay near Lat. $20\frac{1}{2}^{\circ}\text{N.}$, Long. 91°E. It struck the coast between Chittagong and Cox's Bazar about the midnight of 23-24th and weakened very rapidly thereafter.

In association with the development and movement of this storm, squally weather and very rough seas were experienced by several ships in the southeast Bay and the adjoining parts of the Andaman Sea on the 21st evening and in the central Bay the next morning. Winds of 30-40 m.p.h. were continuously blowing in the Andaman Islands for 36 hours from the 21st morning. Moderate to heavy gales blew over the central Bay within a radius of 250-300 miles from the storm centre on the 23rd and extended to the north Bay by the same evening. The winds abated by the 24th morning.

The storm was also responsible for widespread rain over Arakan and Chittagong coasts on the 23rd and widespread rain in Arakan, southeast Bengal and Assam on the 24th. Comilla recorded 10" of rain during the 24 hours ending at 08 hrs. of the 24th. The following are the extracts from the weather diary of Chittagong and Cox's Bazar for the 23rd and 24th :

Chittagong : Drizzle or rain intermittently till 0700 hrs. and continuously thereafter. Moderately heavy breeze since forenoon becoming strong by 1900 hrs. and increasing to gale between 2100-2300 hrs. Direction unestimable. Wind decreasing after midnight.

Cox's Bazar : Morning overcast with continuous light rain and northeasterly gale ; rain and wind increasing with advance day. Between 2000 and 2300 hrs. a serious type of cyclone was experienced with wind NE—SE—S (speed 40 m.p.h.) but by about 2100 hrs. wind speed exceeded 60—70 m.p.h. There was also thunder and lightning. Wind and rain abated by midnight whereafter there was little or no rain and wind became calm.

According to Press reports, the storm caused great havoc over Cox's Bazar-south Chittagong area. All kutcha houses were destroyed rendering thousands of people homeless and destitute ; roofs of houses were blown away upto 2 miles and very big trees were uprooted. Many fishing boats and other country craft were sunk or damaged entailing heavy loss of life. The passenger steamer Malard which was anchored in the Maheshkhali channel off Cox's Bazar was sunk. About 140 persons were rescued by the Pakistan Navy "Oudh" near Kutubdia. The loss of life was reported to be about 500 including those drowned when S.S. Malard

sank. Hundreds of livestock died. The loss of property had been very heavy and the early aman paddy ready for harvesting was seriously damaged.

Some of the noteworthy amounts of rainfall in Assam associated with the storm were : Haflong (N. Cachar hills) 5.3", Kohima (Naga Hills) 4.6", Sialsuk (Lushai hills) 4.5", Sherkawn (Lushai hills) 4.7", Demagiri (Lushai hills) 4.5" on 24th.

16. Bay of Bengal depression of 1st--7th November 1949.—Pressures began falling along the Tenasserim coast on the morning of the 27th of October and on the same evening, Tavoy and Mergui started raining. The upper winds over this area on the next morning indicated the existence of a 'low' over the Gulf of Siam, The 'low' moved westwards into the Andaman Sea by the 30th when weather became unsettled there. The unsettled conditions became marked on the 31st and concentrated into a shallow depression by 08 hrs. of 1st November when it was centred near Lat. 12°N. , Long. 96°E. Moving northwestwards and slightly intensifying at the same time, the depression was centred near Lat. 14°N. , Long. 94°E. on the 2nd morning. Moving northwestwards the depression was centred near Lat. 15°N. , Long. 93°E. on the 3rd morning and near Lat. 17°N. , Long. $89\frac{1}{4}^{\circ}\text{E.}$ on the 4th morning. Thereafter it moved westnorthwest to west and was centred on the 5th morning near Lat. $17\frac{1}{2}^{\circ}\text{N.}$, Long. 87°E. It intensified during the day and at 17 hrs. it lay with its centre about 100 miles east of Vizagapatam. Rain had commenced along the northern Circars coast by that time. On the 6th morning the depression was lying close to the coast just south of Vizagapatam and by midday had passed inland and weakened. It lay as a diffuse low over Hyderabad and the adjoining areas on the 7th morning and became unimportant in the course of the next 24 hours.

In association with the depression, squally weather prevailed in the east central Bay on the 3rd morning and extended into the west central Bay on the next two days. Widespread rain fell along the Circars on the 6th and 7th ; Vizagapatam recording 4" of rain on the morning of the 7th.

17. Deep depression in the Bay of Bengal from 10th to 15th December 1947.—The northeast monsoon was strong in the extreme southwest Bay of Bengal east of Ceylon during the first week of December. An accentuation of the seasonal trough of low pressure in the south Bay resulted in some very heavy falls of rain in east Ceylon on the 6th and 7th when Trincomalee had 6" and 7" respectively. The seat of activity in the trough shifted to southeast Bay in the course of the next three days and by the evening of the 10th, a depression formed centred near Lat. $7\frac{1}{2}^{\circ}\text{N.}$, Long. $92\frac{1}{2}^{\circ}\text{E.}$ Moving westnorthwestwards and intensifying at the same time, it was centred near Lat. $8\frac{1}{2}^{\circ}\text{N.}$, Long. $91\frac{1}{2}^{\circ}\text{E.}$ on the 11th morning. S.S. Vengeance at Lat. 7°N. , Long. $93\frac{3}{4}^{\circ}\text{E.}$ was experiencing SW wind of force 6 and moderate rain. At 17 hrs. of the same day it lay as a deep depression centred near Lat. 9°N. , Long. 91°E. Continuing to move in the same direction, it was centred near Lat. 10°N. , Long. 90°E. on the 12th morning. It intensified further in the course of the day and was centred near Lat. $10\frac{1}{2}^{\circ}\text{N.}$, Long. 88°E. at 17 hrs. On the morning of 13th, the deep depression was centred near Lat. 12°N. , Long. 84°E. At that time many ships to the northeast of the centre were reporting heavy continuous

rain and squalls and rain had commenced along the Coromandel and south Circars coasts. The deep depression thereafter took a northwesterly course and was centred at 08 hrs. of 14th near Lat. 14°N ., Long. 83°E . at which time the rain belt had shifted to the Circars and Orissa coasts. The depression began to weaken then and, on the next morning, lay as a shallow one with its centre about 70 miles southeast of Masulipatam. By the same evening it became unimportant.

In association with this depression widespread rain fell on the 14th and 15th along the entire coastal belt from Madras to Calcutta with locally heavy rain along the Circars Orissa coast. Masulipatam recorded 6" and Vizagapatam 5" during the 24 hrs. ending at 08 hrs. on the 15th. Rainfall also extended into the Deccan, Chota Nagpur and south-west Bengal.

18. Bay of Bengal depression of 19th to 24th December 1947.—The upper winds over Port Blair had strengthened considerably on the morning of the 18th of December. On the same evening, rain commenced there and S.S. Lancashire at Lat. 6°N ., Long. $93\frac{1}{2}^{\circ}\text{E}$. reported SE wind of force 4, while ships near Lat. 9°N ., Long. 85°E . were reporting northerly wind. These indicated that a trough of low pressure was lying in the southeast Bay and the adjoining areas of the southwest Bay of Bengal. The axis of the trough shifted westwards and, in the course of the next 24 hours concentrated into a depression which was centred at 17 hrs. of 19th near Lat. $7\frac{1}{2}^{\circ}\text{N}$., Long. 87°E . Clouds had appeared along the north Coromandel and Circars coasts by then and the upper winds upto 5,000 ft. along the east coast of the Peninsula were gripped in the circulation. Moving northwestwards and intensifying at the same time the depression lay with its centre near Lat. 11°N ., Long 85°E . on the morning of the 20th when it was deep. Ships in the northeast sector about 250 miles away from the centre were experiencing winds of force 6 or 7 and heavy squalls. At 08 hrs. of 21st the deep depression was centred near Lat. 14°N ., Long. $83\frac{1}{2}^{\circ}\text{E}$. and on the next morning about 100 miles east of Masulipatam. The cloud and rain belt had by then extended to the Orissa coast and by that evening to the south Bengal coast. The depression weakened thereafter and moved rapidly northeastwards as a low pressure wave. It could be located as a shallow low centred near Lat. $19\frac{1}{2}^{\circ}\text{N}$., Long. 88°E . on the 23rd morning. By the 24th morning it had passed inland across the Chittagong coast.

Under the influence of this depression, widespread rain occurred along the north Coromandel, Circars and south Orissa coasts on the 21st. During the next two days widespread and locally heavy rain also occurred over the Circars and Orissa coasts and extended into south Bengal on the 23rd and 24th.

Some of the noteworthy amounts of rainfall in Orissa associated with the depression were : Chatrapur 3.5" on 21st ; Gop 3.8", Berhampore 3.2", Gopalpur 3.2" on 22nd ; Angul 3.0", Balasore 3.1", Gop 3.8" on 23rd.

II. ACCOUNT OF WESTERN DISTURBANCES DURING 1947

The eastern disturbances during the year were generally feeble. Their secondaries, however, were more active and

gave good rainfall in the central parts of the country and in Orissa in January and induced spells of marked nor' wester activity in March during their eastward movement across northeast India.

A western disturbance in the last week of May caused locally severe duststorms and dust-raising winds in the Punjab and the west United Provinces on the 27th and 28th. According to press reports, the duststorm which blew over Kanpur (United Provinces) on the 27th uprooted several trees and telegraph and telephone poles in that city on that day.

A list of 52 western disturbances classified according to the nature of precipitation caused by them, together with a short description of some of the active disturbances is given below :

TABLE 12

Nature of precipitation	Number of western disturbances											
	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Widespread	1	3	3	2	..	..	..	1	1	..	..	1
Local	2	1	..	2	5	2	2	..	2	..	..	2
Little or nil	2	2	2	2	1	1	..	2	1	3	5	1
No. of disturbances in each month.	5	6	5	6	6	3	2	3	4	3	5	4

1. Western disturbance from 17th to 21st March 1947.—A western disturbance which moved northeastwards from Baluchistan to the Punjab-Kumaon hills between the 17th and 19th March caused fairly widespread precipitation in Kashmir on the 18th and 19th and in and near the hills of the west United Provinces and the East Punjab on the 19th. It induced a secondary over the southern districts of the United Provinces on the 19th which moved eastwards and became unimportant over Bihar on the 21st. The influx of moisture in association with this low was responsible for marked thunderstorm activity over northeast India on the 20th with hailstorms at some stations.

2. Western disturbances from 16th to 22nd December 1947.—A western disturbance moved from Baluchistan northeastwards to Kashmir between the 16th and 18th December without causing any precipitation. It induced a secondary in the north Arabian Sea off the Sind coast on the 18th, which moved into Sind on the 19th. Moving northeastwards, the secondary lay over Rajputana on the 20th and 21st and passed away across the hills of the East Punjab by the 22nd. In the meantime, another disturbance moved from Baluchistan to Kashmir. Under the influence of these systems, fairly widespread thundershowers occurred over the region from Kashmir and the west Central Provinces to the east United Provinces on the 21st and 22nd and local thundershowers in east Rajputana on the 20th and in Kashmir and in and near the hills of the East Punjab and the west United Provinces on the 23rd.

III. LOCAL STORMS

Some of the noteworthy local storms reported in newspapers are given below :

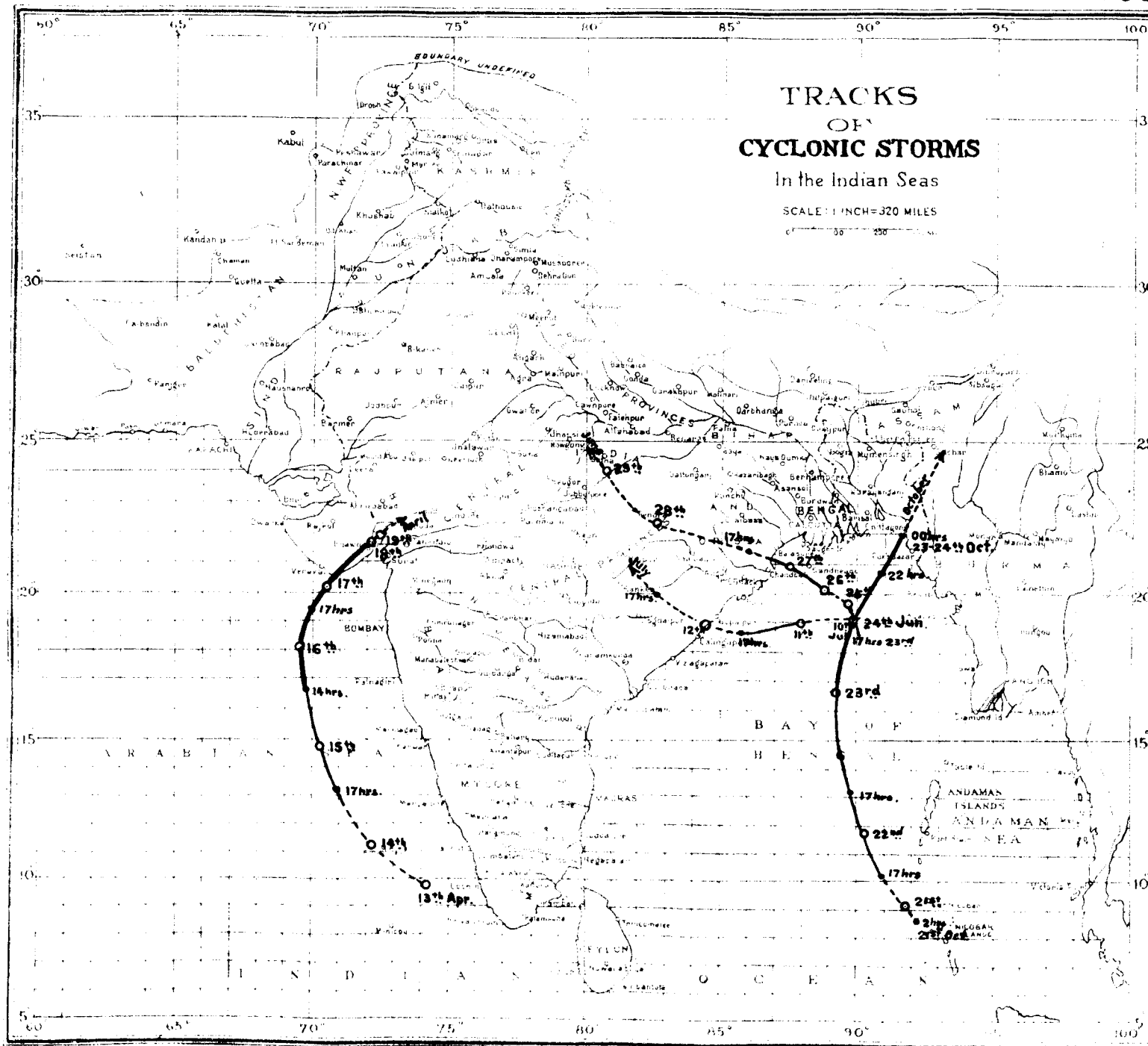
Serial No.	Place	Date	Time	Classification of storm	Loss of human life	Remarks
1	Jalgaon District (Bombay) ..	1st January	Night (31st Dec.-1st Jany.)	Hail Storm	..	Severe damage was caused to standing rabi crop and cattle. The hail stones fell for nearly one hour, some of them being as big as an egg.
2	Chandur, Ichalkaranji, Kumbhoj etc. (in Kolhapur State).	About 3rd January	..	Severe Hailstorm	..	At Chandur the hail storm continued for three hours and over, when 150 persons were injured and became unconscious as a result of their being incessantly struck by hailstones ; nine horses fell dead and 75 sheep lost their lives. Tobacco crops suffered heavily at Kumbhoj. Some dwelling houses occupied by the Polish refugees in Valivda camp near Kolhapur, were razed to the ground causing misery and suffering to the inmates.
3	Badarpur (Assam) ..	6th April	Night	Thunderstorm	3 died and many injured	Caused heavy damage to property. Railway staff quarters were damaged, some roofs were blown away and electric installations and water mains were badly damaged.
4	Kandi (West Bengal) ..	19th April	Afternoon	Severe Thunderstorm.	One	A large number of houses was blown away and trees were uprooted. Several persons were injured and there were also some loss of cattle.
5	Muzaffarpur (Bihar) ..	28th April	Evening	Thunderstorm.	..	Trees were uprooted, roofs of several houses were blown off and electric supply was dislocated. In the interior of the district, extensive damages to houses and standing crops were reported.
6	Narar Fover (Darbhanga district, Bihar).	28th April	Night	..	23 killed and some injured	900 houses were gutted, 23 persons burnt alive and some others seriously injured on account of a fire spread by the wind.
7	Darbhanga District, (Bihar)	28th April	Night	..	..	About 60,000 houses all over the district were swept away. Losses of life were reported from several places. The wind associated with the storm is reported to have scattered embers from domestic fires and caused a huge conflagration in which 27 were burnt alive, several received burn injuries and about 200 cattle perished in the Harar village.
8	Jorhat (Assam) ..	28th April	Night	Heavy Hailstorm	3	A steam ferry sank in Brahmaputra and three out of the crew of ten were untraceable. Many houses were damaged and several trees were uprooted.
9	Poona ..	19th May	Evening and Night	Thunderstorm	..	Electric supply was interrupted and the whole city was in darkness for nearly seven hours.
10	Bijapur (Bombay) ..	20th May	Night	..	..	Electric supply was cut off plunging the city in darkness. Many trees were uprooted and roofs blown off.
11	Diamond Harbour (West Bengal).	24th May	Night	Nor'wester	75	A boat with 145 passengers and 250 maunds of merchandise was overtaken by a nor'wester about 20 miles from Diamond Harbour and capsized. Only 70 passengers were rescued.
12	Kanpur (United Provinces)	26th May	Evening	Dust and Thunderstorm.	..	Many trees and telegraph and telephone poles were uprooted.
13	Bareilly (United Provinces)	28th June	Morning	Heavy Thunderstorm.	One killed and several others injured.	Many trees were uprooted. Telephone and electric services were dislocated.
14	Madras ..	15th July	Evening	Thunderstorm	One killed and a few others injured.	Accidents occurred due to walls collapsing when one child died and a few persons were injured.

WINDS OF FORCE NINE OR MORE IN INDIAN SEAS

Excluding dates of storms and depressions, a description of which has been given above, winds of force nine or more

were recorded on ships in the Indian Seas during the year 1947, on the following occasions :

Date	Name of ship	Approximate position	
		Lat. ° N.	Long. ° E.
14th July	Holly Bank	10	64
10th August	6.5	50.5





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